

EXHIBIT G

REDACTED

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**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS**

_____	§	
SINGULAR COMPUTING LLC,	§	
	§	Civil Action No. 1:19-cv-12551-FDS
Plaintiff,	§	
	§	
v.	§	JURY TRIAL DEMANDED
	§	
GOOGLE LLC,,	§	
	§	
Defendant.	§	
_____	§	

**PLAINTIFF’S OBJECTIONS AND RESPONSES TO DEFENDANT’S FIRST SET OF
INTERROGATORIES [NOS. 1-12]**

Pursuant to Fed. R. Civ. P. 26 and 33, **Plaintiff, Singular Computing LLC** (“**Plaintiff**” or “**Singular**”), serves these objections and responses to Defendant, Google LLC’s (“**Google**”), First Set of Interrogatories (Nos. 1-12).

Singular’s investigation and discovery efforts in this case are ongoing. Thus, these objections and responses are based only on information presently available and known to Singular. Singular reserves its right to supplement or amend these objections and responses as this case develops, and if and when Singular discovers additional responsive information.

Singular also reserves its right to object to the admissibility of any of its objections or responses, and to any document produced or referenced in response to these interrogatories, in whole or in part, at trial or in connection with any hearing, deposition, or other proceeding in this action, on any grounds, including but not limited to authenticity, materiality, relevance, and privilege. In addition, any statement that documents will be produced in response to a particular interrogatory means only that the documents will be produced if such documents exist, are in

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Singular’s possession, custody, and control; are relevant and non-privileged; and can be located following a reasonably diligent search.

GENERAL OBJECTIONS

Singular **objects to Google’s Interrogatories** as:

1. overly broad and unduly burdensome;
2. imposing discovery obligations in excess of the applicable Federal Rules of Civil Procedure, the Local Rules for the United States District Court for the District of Massachusetts, or any order of the Court;
3. seeking irrelevant information;
4. vague and ambiguous;
5. seeking information protected by the attorney-client privilege or the work product doctrine;
6. seeking discovery the burden or expense of which outweighs the likely benefit;
7. seeking expert disclosures before the time, and other than in the manner, specified by order of this Court or the Federal Rules of Civil Procedure; and
8. to the extent they consist of multiple, discrete subparts that have not been numbered, yet constitute separate and distinct interrogatories.

These General Objections are incorporated by reference, without restatement, into the specific responses below.

INTERROGATORY RESPONSES

INTERROGATORY NO. 1:

Separately for each asserted claim of each of the Patents-in-Suit, describe in detail all facts relating to its conception and reduction to practice, including the conception date and the date of reduction to practice of its subject matter; all acts that you contend represent diligence occurring between the dates of conception and reduction to practice; the identity of each person, including

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third parties, who worked on conceiving and reducing the alleged invention to practice and each **person’s role; and the identity of all documents relating to conception and reduction to practice.**

RESPONSE:

In addition to its General Objections, Singular specifically objects to the timing of Interrogatory No. 1, which requests, prior to claim construction, a detailed description of all facts **relating to Singular’s conception and reduction to practice of each asserted claim of the Patents-in-Suit.** *See, e.g., X2Y Attenuators, LLC v. ITC*, 757 F.3d 1358, 1365 (Fed. Cir. 2014) (Reyna, J., concurring) (“**Where the claims have** not been properly construed, the full scope of the claim is unknown, thereby rendering baseless any determination of written support in an earlier patent. It follows that entitlement to priority cannot be decided without first construing the asserted **claims...**”); *see also University of Virginia Patent Foundation v. General Elec. Co.*, 2015 WL 4878880, *4-*5 (W.D. Va. 2015) (interrogatories regarding § 112 support in specification were premature and did not need to be answered until after claim construction ruling). Singular does not object to supplementing, and will agree to supplement, its response to Interrogatory No. 1 to provide the information Google has requested within a reasonable time after the Court has issued a claim construction ruling in this case.

INTERROGATORY NO. 2:

Separately for each asserted claim of each of the Patents-in-Suit, describe in detail all facts and circumstances relating to the first written description, offer for sale, sale, public disclosure, public use, or disclosure of the claimed invention to any person other than a named inventor, including the identity of the person involved, the date on which it occurred, and the identity of all related documents.

RESPONSE:

In addition to its General Objections, Singular specifically objects to Interrogatory No. 2 to the extent it seeks information or communications protected by the attorney-client privilege or

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work product doctrine. Singular also specifically objects to the timing of Interrogatory No. 2, which requests identification, prior to claim construction, of the first written description, offer for sale, public disclosure, public use, or other disclosure of each asserted claim. *See, e.g., X2Y Attenuators, LLC v. ITC*, 757 F.3d 1358, 1365 (Fed. Cir. 2014) (Reyna, J., concurring).

(“Where the claims have not been properly construed, the full scope of the claim is unknown, thereby rendering baseless any determination of written support in an earlier patent. It follows that entitlement to priority cannot be decided without first **construing the asserted claims...**”); *see also University of Virginia Patent Foundation v. General Elec. Co.*, 2015 WL 4878880, *4-*5 (W.D. Va. 2015) (interrogatories concerning § 112 support in specification were premature and need not be answered until after claim construction ruling). Singular does not object to supplementing, and will agree to supplement, its response to Interrogatory No. 2 to provide the information Google has requested within a reasonable time after the Court has issued a claim construction ruling in this case.

INTERROGATORY NO. 3:

Identify any product (whether hardware or software) that has practiced any claim of the Patents-in-Suit, or that you allege to be an embodiment of any invention claimed in the Patents-in-Suit, including products designed, programmed, owned, marketed, sold or licensed by you.

RESPONSE:

In addition to its General Objections, Singular specifically objects to Interrogatory No. 3 as overly broad, unduly burdensome, not proportional to the needs of this case, and seeking wholly irrelevant information, as the Interrogatory is unbounded in scope, and would require needless analysis and expert opinion concerning infringement by any and all third parties and third-party products. Singular will thus respond to Interrogatory No. 3 with respect to Google, Singular, and

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their respective product(s) only. Singular also specifically **objects to the use of the term “product”** in Interrogatory No. 3 as vague, ambiguous, and undefined **by Google’s First Set of Interrogatories**.

Subject to and without waiving its objections, Singular responds that Google’s Tensor Processing Unit Version 2 (“TPUv2”) and Tensor Processing Unit Version 3 (“TPUv3”) each embody each asserted claim in this action. Further, Singular hereby incorporates by reference into this response its Infringement Contentions, as amended from time to time. Singular also identifies its S1 Prototype.

INTERROGATORY NO. 4:

Describe in detail all the manners or techniques by which each claim of the Patents-in-Suit improved upon the prior art, added functionality that did not exist in the prior art, or provided a variation on or upgrade of the prior art, and explain why.

RESPONSE:

In addition to its General Objections, Singular specifically objects to Interrogatory No. 4 as seeking the subject of expert disclosures before the time, and other than in the manner, specified by order of this Court and the Federal Rules of Civil Procedure. Singular will serve its **expert report concerning validity at the time specified by the Court’s Scheduling Order, as** amended from time to time, and in the manner required by any order of this Court or the Federal Rules of Civil Procedure.

Subject to and without waiving its objections, Singular responds that the novel and improved computer architectures developed by Dr. Bates provide for the inclusion within computer processors of processing elements designed to perform low precision and high dynamic range (LPHDR) arithmetic operations. **Dr. Bates’ patented architectures, allow for, *inter alia*, more efficient use of a computer’s transistors and have revolutionized the way AI** training and inference are accomplished.

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As one example, a multiplication operation requested by many software programs requires on the order of a million transistors per multiplication operation when using a conventional computer architecture. Implementing **Dr. Bates’ LPHDR architecture, however,** can require a far smaller number of transistors per multiplication operation. That vast difference in the required number of transistors per multiplication operation creates the opportunity to pack into a computer having a normal number of transistors (e.g., several billion transistors, for a personal computer) a very large number of LPHDR processing elements that can each perform an operation per period. Such a large number of LPHDR processing elements can collectively perform a number of operations per period that is on the order of a hundred times larger than the number of operations per period performed by a conventional computer having the same number of transistors. **A computer utilizing Dr. Bates’ novel architecture achieves this advantage—**executing a far larger number of operations per period than a conventional computer—while supporting software programs that require operations to be performed on numbers having high dynamic range.

The asserted claims accomplish the foregoing even though the constituent LPHDR processing elements frequently generate, in response to requests to perform arithmetic operations, results that materially differ from the exact results of those operations. Singular’s LPHDR processing elements used in an AI software program, for example, can generate results in response to requested arithmetic operations that differ by at least 0.2% from their respective exact results, for at least 10% of all such requested operations, and yet still enable that AI software program to function correctly. It was counterintuitive to those skilled in the art as of 2009 to make a computer from a very large number of LPHDR processing elements that each frequently generate such materially inexact results, knowing that such a computer was going to

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be used by software programs to execute numerous tasks that each required hundreds, thousands or even millions of sequential arithmetic operations that could accumulate errors. Yet Dr. Bates conceived and made such a computer utilizing his novel and patented computer architectures.

Furthermore, LPHDR processing elements can, in some embodiments of **Dr. Bates’** patented computer architectures, be deployed within a computer in massively parallel configurations to further amplify their relatively higher efficiency. In still other exemplary configurations, massive numbers of these LPHDR processing elements can be deployed in conjunction with far smaller numbers of higher precision processing elements found within conventional computer architectures, to extend the range of software programs that can benefit from **Plaintiff’s** high-efficiency computing architecture.

INTERROGATORY NO. 5:

If you contend that you are entitled to any monetary recovery as a result of alleged infringement of the Patents-in-Suit by Google, state whether you contend that you are entitled to lost profits or a reasonable royalty, and state all facts, evidence, and reasons upon which you rely in support of your contention, such that if you contend you are entitled to an award of lost profits damages, you identify each of your products you allege falls within the scope of any claim of the Patents-in-Suit and state the total sales annually in units and dollars from its introduction to the present, and if you contend you are entitled to an award of reasonable royalty damages, state what you assert to be a reasonable royalty to be paid by Google under 35 U.S.C. section 284, including the complete factual bases on which you base your calculation of such royalty rate.

RESPONSE:

In addition to its General Objections, Singular specifically objects to Interrogatory No. 5 as seeking expert disclosures before the time, and other than in the manner, specified by order of this Court and the Federal Rules of Civil Procedure. Opening expert reports in this action are not due to be served until August 27, 2021. Singular will therefore serve its expert report regarding damages on August 27, 2021.

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Subject to and without waiving its objections, Singular nevertheless responds that it is entitled to damages of no less than a reasonable royalty for the use made by Google of **Singular’s** patented inventions, as well as trebled damages on account of the willfulness of **Google’s** infringement. Singular also hereby incorporates by reference its response to Interrogatory No. 7, as well as its expert report concerning damages, including all exhibits, appendices, and supplements thereto, as of the date that each document is served upon Google.

INTERROGATORY NO. 6:

For each of the Patents-in-Suit, state the priority date you contend applies for each asserted claim and identify the portion(s) of the specification in any earlier application that support that priority date.

RESPONSE:

In addition to its General Objections, Singular specifically objects to the timing of Interrogatory No. 6, which asks Singular to state, prior to claim construction, the priority date that it contends applies for each asserted claim of the Patents-in-Suit, and an identification of those portions of the specification in any earlier application that support the priority date. *See, e.g., X2Y Attenuators, LLC v. ITC*, 757 F.3d 1358, 1365 (Fed. Cir. 2014) (Reyna, J., concurring). (“**Where the claims have not been** properly construed, the full scope of the claim is unknown, thereby rendering baseless any determination of written support in an earlier patent. It follows that entitlement to priority cannot be decided without first **construing the asserted claims...**”); *see also University of Virginia Patent Foundation v. General Elec. Co.*, 2015 WL 4878880, *4-*5 (W.D. Va. 2015) (interrogatories concerning § 112 support in specification were premature and need not be answered until after claim construction ruling). Singular does not object to supplementing, and will agree to supplement, its response to Interrogatory No. 6 to provide

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Singular’s contentions within a reasonable time after the Court has issued a claim construction ruling in this case.

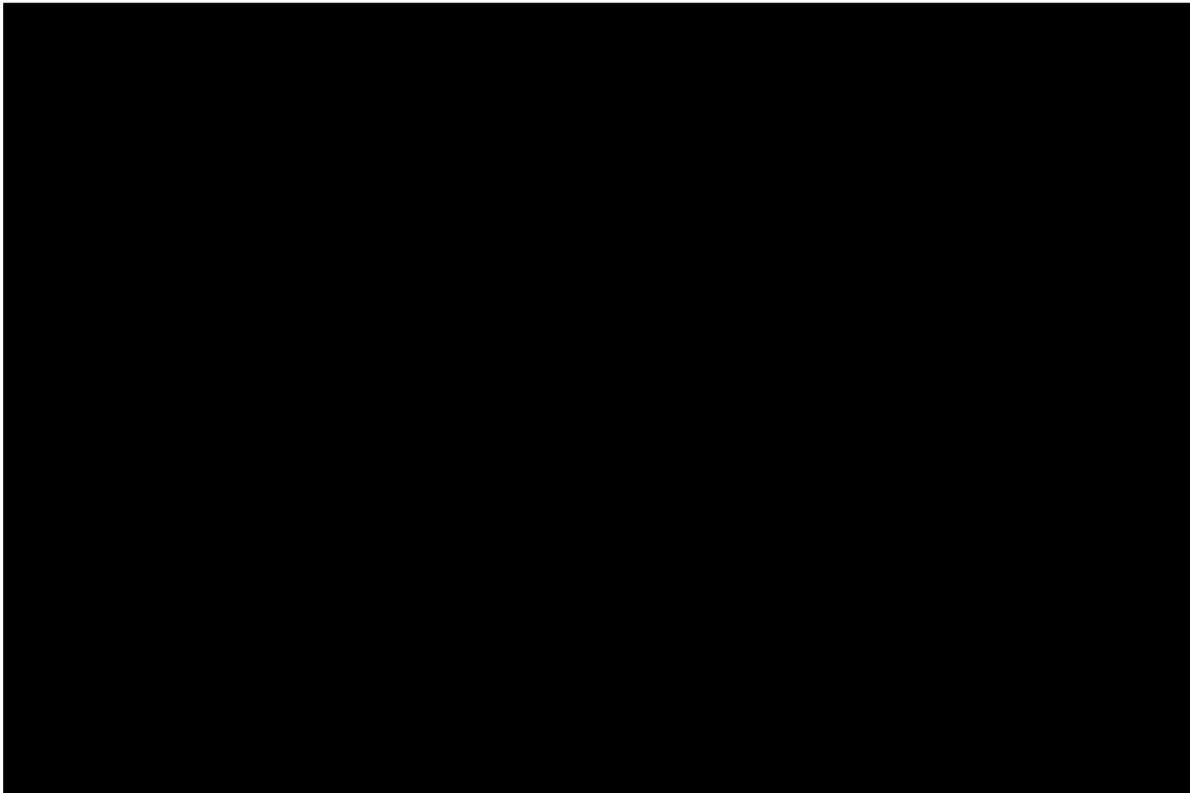
INTERROGATORY NO. 7:

Identify all facts and circumstances relating to your allegation that Google willfully infringes any of the Patents-in-Suit, including the identity of all related persons and documents and the date on which you contend that Google first became aware of the Patents-in-Suit.

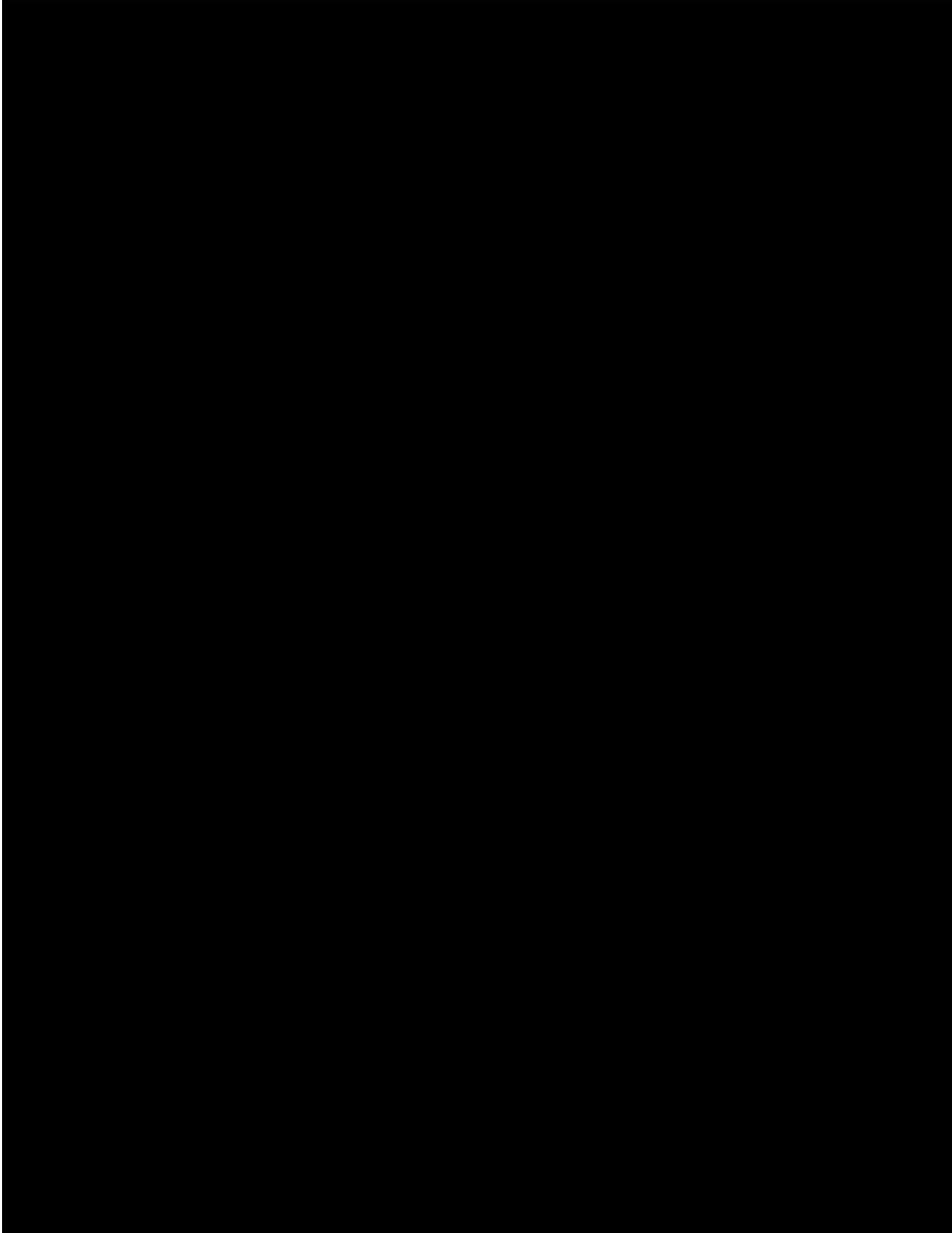
RESPONSE:

In addition to its General Objections, Singular specifically objects to Interrogatory No. 7 to the extent it seeks information or communications protected by the attorney-client privilege or the work-product doctrine.

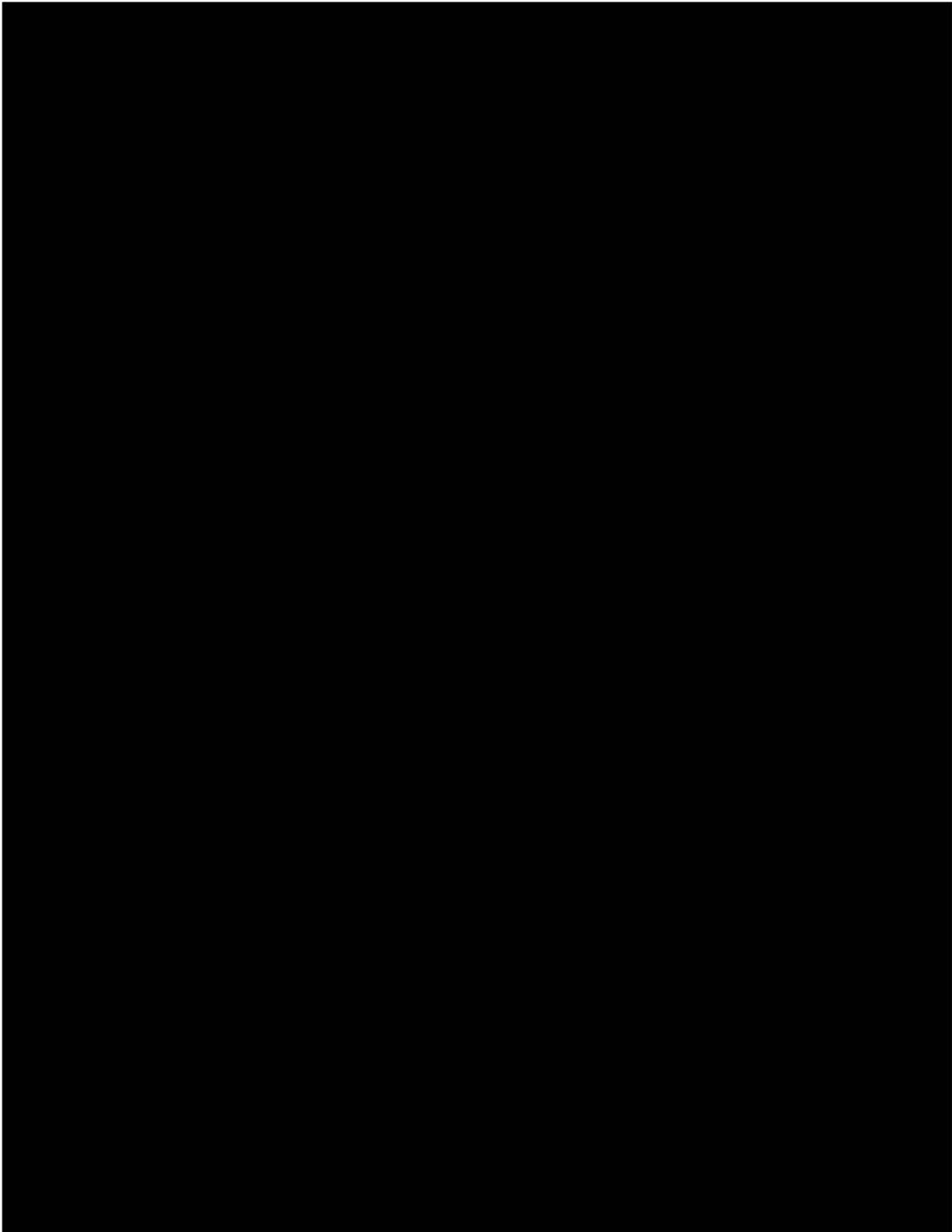
Subject to and without waiving its objections, Singular responds as follows:



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By May 2017, Google knew or should have known of US Patent Nos. 8,407,273 and 9,218,156 patents prior to the launch of the accused Cloud Tensor Processing Unit Version 2 (TPUv2 Device) in May 2017. Additionally, prior to the launch of the accused TPUv2 and TPUv3 Device, Google knew or should have known that those accused devices infringed US Patent Nos. 8,407,273 and 9,218,156 or was willfully blind to such infringement.

INTERROGATORY NO. 8:

Describe in detail any proposed, requested, or executed assignment, license, conveyance, and/or grant of any right, title or interest in or to the Patents-in-Suit, including the identity of all persons involved therein and any documents related thereto.

RESPONSE:

With the exception of information concerning proposed, requested, or executed licenses Plaintiff refers Defendant, pursuant to Fed. R. Civ. P. 33(d), to Exhibit A to these responses for information responsive to Interrogatory No. 8. With respect to proposed, requested, or executed licenses to the Patents-in-Suit, Plaintiff will produce documents responsive to Interrogatory No. 8 on September 4, 2020, and will simultaneously supplement its response to this Interrogatory to identify the responsive documents by production numbers.

INTERROGATORY NO. 9:

Describe in detail all sources of funding for the research and development of the technology claimed in the Patents-in-Suit, including university and government funding.

RESPONSE:

In addition to its General Objections, Singular specifically objects **to the terms “research and “development of” as vague and ambiguous with respect to the term “technology claimed in the Patents-in-Suit.”** **Subject to** and without waiving its objections, Singular responds that all research and development of the technology claimed in the Patents-in-Suit was funded by

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Plaintiff and an investor in Singular—[REDACTED]—up until the filing of its provisional patent application on June 19, 2009. Subsequent to the filing of its provisional application in June 2009, Singular received funding from the Defense Advanced Research Projects Agency (DARPA) to build a prototype of **Singular’s** patented invention.

INTERROGATORY NO. 10:

Describe in detail the “Singular test” referenced in paragraphs 94, 111, and 129 of Singular’s First Amended Complaint, including the number of tests, how the tests were conducted (including the related software, hardware, or combination thereof used), the parameters for the tests (including the assumptions made), the personnel who conducted the tests, the full results of the tests, and what constituted “a mathematically representative sample of all possible valid pairs of inputted float32 numerical values.”

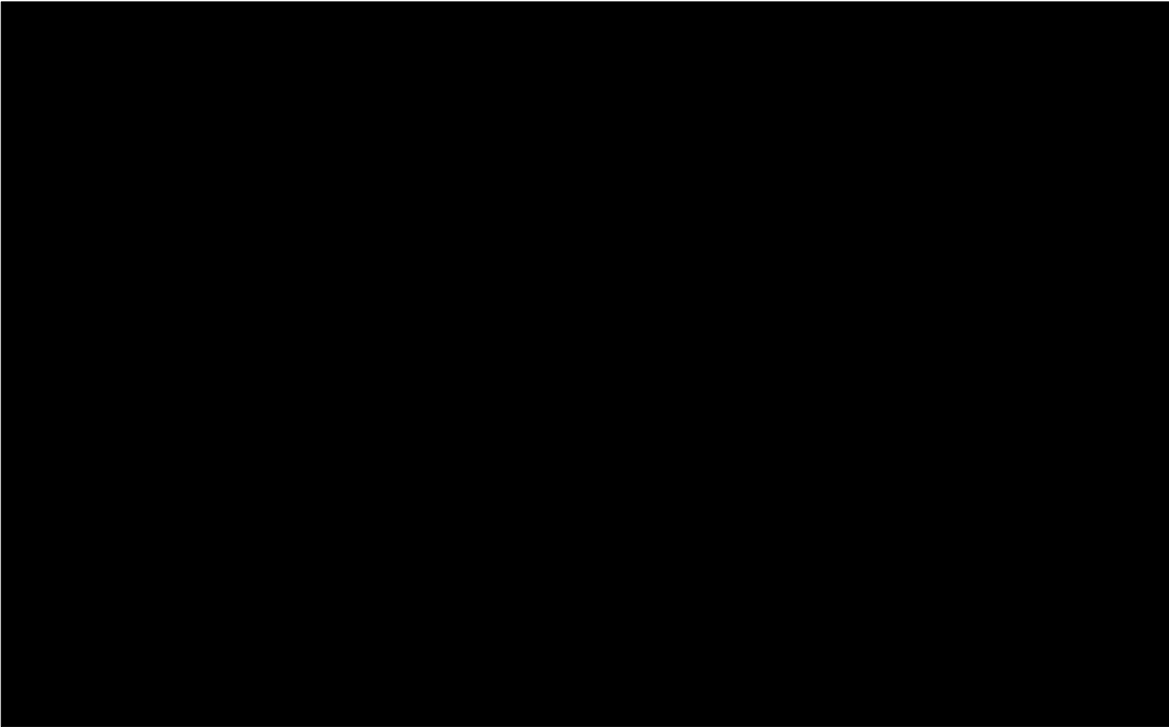
RESPONSE:

Subject to and without waiving its objections, Singular responds as follows:

Per the Amended Complaint, ¶ 94: “When the float32 numerical values produced by the TPU’s float32 multiplication operation (which ... is performed at ‘reduced bfloat16 precision’), for a mathematically representative sample of all possible valid pairs of inputted float 32 numerical values, are compared to the numerical values produced by the exact full precision multiplication operations for those same respective valid pairs of inputted float32 numerical values, the TPU’s float32 numerical values differ, for at least 5% of those multiplied pairs from the respective exact full precision values, by at least 0.05%.”

[REDACTED]

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INTERROGATORY NO. 11:

For each of the Patents-in-Suit, describe in detail all facts related to any attempts to commercialize, including identifying: each commercialization attempt; each person, including third parties, who were involved in efforts to commercialize the alleged invention, including **each person’s role; any third parties to whom commercialization** efforts were targeted; and all documents constituting, evidencing, or otherwise relating to any attempts to commercialize.

RESPONSE:

In addition to its General Objections, Singular specifically objects to Interrogatory No. 11 as **vague and ambiguous with respect to the terms “commercialization” and “commercialize,”** which terms are not defined by **Google’s** First Set of Interrogatories.

Subject to and without waiving its objections, Singular responds that it will produce documents responsive to Interrogatory No. 11 on September 4, 2020, and will simultaneously supplement its response to this Interrogatory to identify the responsive documents by production numbers.

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INTERROGATORY NO. 12:

For each asserted claim, identify, on a limitation-by-limitation basis, where in the specification the written description and enabling disclosure for such limitation is provided as required by 35 U.S.C. § 112.

RESPONSE:

In addition to its General Objections, Singular specifically objects to the timing of Interrogatory No. 12, which seeks a response from Singular in advance of a claim construction order in this action. *See, e.g., X2Y Attenuators, LLC v. ITC*, 757 F.3d 1358, 1365 (Fed. Cir. 2014) (Reyna, J., concurring) (“**Where the claims have not been properly construed, the full scope of the claim is unknown, thereby rendering baseless any determination of written support in an earlier patent. It follows that entitlement to priority cannot be decided without first construing the asserted claims...**”); *see also University of Virginia Patent Foundation v. General Elec. Co.*, 2015 WL 4878880, *4-*5 (W.D. Va. 2015) (interrogatories concerning § 112 support in specification were premature and need not be answered until after claim construction ruling). Singular does not object to supplementing, and will agree to supplement, its response to Interrogatory No. 12 to provide the requested information within a reasonable time after the Court has issued a claim construction ruling in this case.

Dated: August 26, 2020

Respectfully submitted,

/s/ Paul J. Hayes

Paul J. Hayes (BBO #227000)

Matthew D. Vella (BBO #660171)

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ATTORNEYS FOR THE PLAINTIFF

CERTIFICATE OF SERVICE

I certify that on August 26, 2020, I served this document on Defendant by causing a copy to be sent via electronic mail to its counsel of record.

/s/ Paul J. Hayes

EXHIBIT A

13/399,884

Processing with Compact Arithmetic Processing Element

SNG.1001C1

08-25-
2020::00:11:14**Patent Assignment Abstract of Title****Total Assignments: 1****Application #:** 13399884**Filing Dt:** 02/17/2012**Patent #:** 8407273**Issue Dt:** 03/26/2013**PCT #:** NONE**Intl Reg #:****Publication #:** US20130031153**Pub Dt:** 01/31/2013**Inventor:** Joseph Bates**Title:** Processing with Compact Arithmetic Processing Element**Assignment: 1****Reel/Frame:** 027726 / 0699**Received:** 02/17/2012**Recorded:** 02/17/2012**Mailed:** 02/20/2012**Pages:** 2**Conveyance:** ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).**Assignor:** BATES, JOSEPH**Exec Dt:** 06/15/2010**Assignee:** SINGULAR COMPUTING LLC
10 REGENT STREET
NEWTON, MASSACHUSETTS 02465**Correspondent:** ROBERT PLOTKIN, PC
15 NEW ENGLAND EXECUTIVE OFFICE PARK
BURLINGTON, MA 01803

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13/849,606

PROCESSING WITH COMPACT ARITHMETIC PROCESSING
ELEMENT

SNG.1001C2

08-26-
2020::19:16:54**Patent Assignment Abstract of Title****Total Assignments: 1****Application #:** 13849606**Filing Dt:** 03/25/2013**Patent #:** 9218156**Issue Dt:** 12/22/2015**PCT #:** NONE**Intl Reg #:****Publication #:** US20140095571**Pub Dt:** 04/03/2014**Inventor:** Joseph Bates**Title:** PROCESSING WITH COMPACT ARITHMETIC PROCESSING ELEMENT**Assignment: 1****Reel/Frame:** 030075 / 0766**Received:** 03/25/2013**Recorded:** 03/25/2013**Mailed:** 03/26/2013**Pages:** 2**Conveyance:** ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).**Assignor:** BATES, JOSEPH**Exec Dt:** 06/11/2010**Assignee:** SINGULAR COMPUTING LLC

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16/175,131

PROCESSING WITH COMPACT ARITHMETIC PROCESSING
ELEMENT

SNG.1001C5

08-26-
2020::19:18:51**Patent Assignment Abstract of Title****Total Assignments: 1****Application #:** 16175131**Filing Dt:** 10/30/2018**Patent #:** 10416961**Issue Dt:** 09/17/2019**PCT #:** NONE**Intl Reg #:****Publication #:** US20190065147**Pub Dt:** 02/28/2019**Inventor:** Joseph Bates**Title:** PROCESSING WITH COMPACT ARITHMETIC PROCESSING ELEMENT**Assignment: 1****Reel/Frame:** 047360 / 0563**Received:** 10/30/2018**Recorded:** 10/30/2018**Mailed:** 10/31/2018**Pages:** 2**Conveyance:** ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).**Assignor:** BATES, JOSEPH**Exec Dt:** 06/11/2010**Assignee:** SINGULAR COMPUTING LLC
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NEWTON, MASSACHUSETTS 02465**Correspondent:** ROBERT PLOTKIN
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